SEARCH FOR TRIAXIAL SUPERDEFORMATION AND WOBBLING MODE IN ^{172,171}Hf*

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A low-lying collective excitation mode uniquely related to the rotational motion of a nucleus with a stable triaxial deformation is the wobbling mode [1], characterized by a sequence of wobbling bands with increasing number of wobbling quanta, n_w= 0, 1, 2, ... This mode has recently been established in ^{163,165,167}Lu (Z=71) [2]. Lifetime measurements confirmed the large deformation ($Q_t \sim 8.4$ *eb*, $\varepsilon_2 \sim 0.36$) associated with these bands, which are consequently called Triaxial Strongly Deformed (TSD) bands. Further theoretical studies indicate that the presence of an aligned $i_{13/2}$ proton in Lu isotopes plays a significant role for the wobbling to compete energetically with other excitations. While the wobbling mode was first described [1] for even-even systems, and ^{164,166}Hf were later predicted to be the best candidates for TSD structures by several theoretical investigations, so far the wobbling mode has not been observed in any Hf (Z=72) isotope. Superdeformed (SD) bands ($Q_t \sim 12$ *eb*, $\varepsilon_2 \sim 0.45$) have, indeed, been found in ^{168,170,174}Hf [3]. The bands, however, appear to be quite different from the TSD bands in Lu isotopes: they are much weaker and decay to normal deformed (ND) structures at much higher spins. No linking transitions between these SD bands can be identified. While there are indications that the Hf bands are likely associated with triaxial structures (TSD), the role of the aligned particles in the description of wobbling excitations in an even-even, or single neutron-even proton system will be different from that of the single $i_{13/2}$ proton in the Lu isotopes. The nature of these Hf bands and whether the wobbling mode exists in Hf nuclei remain open questions.

We performed a Gammasphere experiment using the ^{48}Ca(^{128}Te, xn)^{172,171}Hf reactions to search for TSD structures and the wobbling mode in ^{171,172}Hf. Resent calculations [3] suggest that ^{172}Hf may be one of the best candidates for such studies. High-fold, high statistics coincidence data have been obtained. The results from this experiment, together with previous results in other Hf isotopes, will give us a better understanding of superdeformation and triaxiality in Hf isotopes, and may help identify the high-j orbitals responsible for the excitations. When triaxiality is involved, these orbitals are poorly known at the moment because very little experimental data is available.

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[3] M. Djongolov *et al.*, Phys. Lett. B **560** (2003) 24, and references therein.